

Per- and Polyfluoralkyl Substance (PFAS) Impacts of Stormwater Retention Ponds from Emergency Fire Response at Recycling Center

James R. Dickson, P.E. (jdickson@cticompanies.com), and
Chris Winkeljohn, P.E. (cwinkeljohn@cticompanies.com)
(CTI and Associates, Inc., Kansas City, MO, USA)

Background/Objectives. Emergency response to a recycling center fire by the local fire department resulted in the use of firefighting foam to extinguish the burning plastic bottles. Following the fire the State Environmental Authority required the gravity pond outfalls to be closed and samples collected for PFAS. The regulatory limits for emerging contaminants of PFAS in the State surface waters consist of perfluorooctanoic acid (PFOA) (0.42 µg/L) and perfluorooctane sulfonate (PFOS) (0.011 µg/L). Analytical results indicated that Pond 1 has an average concentration of 47.30 µg/L for PFOS and 2.0 µg/L for PFOA with an estimated volume of 1.5 million gallons (MG). POND 2 has an average concentration of 4.08 µg/L for PFOS and 0.16 µg/L for PFOA with an estimated volume of 0.3 MG. In addition, all sediments in Pond 1 estimated to be 2,430 CY have an average concentration of 1,300 µg/kg of PFOS and less than 1 µg/kg of PFOA. This ongoing project includes a full evaluation of potential treatment technologies in development for PFAS water and sediments removal/fixation to determine the most cost effective solution.

Approach/Activities. The technologies for water treatment include activated carbon system, synthetic resin system, carbon system with resin polish, and proprietary PerFluorad® system. Multiple vendors of readily available technologies were contacted to evaluate cost and efficacy with data available. PFAS fixation technology RemBind® and disposal options were evaluated for sediments. Preliminary data was sent for evaluation of potential sediment options. The preliminary evaluation is presented below:

Results/Lessons Learned. The evaluation of treatment/fixation technologies was performed based on current state of this developing market. Pump and hauling of surface water to a local landfill that accepts PFAS waste (location specific) has been used as a baseline value at approximately \$0.15 per gallon for the site. Pump and treat by carbon and direct discharge is readily available and several vendors have rental units established making this a readily available technology with cost of about \$0.04 per gallon. The turn-around-time for PFAS sample results and preferential sorption of total organic compounds (TOC) and other organic compounds usually require additional vessels in series or accelerated column tests to ensure sufficient removal before discharge. Resin column systems work well at removal of PFAS but the media cost is very expensive. The use of resin only system is not currently available for rent at this time and can cost up to \$0.14/gallon with the initial investment cost. The use of carbon treatment systems with a resin polish can be more cost effective with more assurance that discharge limits will be met for direct discharge and can cost approximately \$0.06 per gallon. PerFluorad® water treatment systems have proven successful in Europe and could be a very cost effective solution in the future but the US market is still developing and extraction rates appear to be limited to less than 10 gallons per minute.

Use of RemBind® stabilization for soil/sediments is proven in the US and readily available with a typical cost estimated at \$210 per ton treated. Pilot studies can be performed in advance to optimize this cost based on site specific conditions. The advantage is that the stabilized waste can remain in place without leaching based on testing that simulated 1,000 years of acid rain. Direct disposal is currently not regulated at a cost of \$50/ton. This could result in future liability as disposal restrictions and leachate monitoring becomes required in the future.